
Trigger Monitoring for MTCC and beyond

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May 3, 2006



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Monitoring for Trigger - an overview

- Here focusing on monitoring L1 trigger
 - Nothing excludes HLT - am just focusing on L1
 - Happy to include HLT too - please let me know if anything I write here is incompatible with HLT group's plans

For L1:

- Envision three “types” of monitoring
 - XDAQ
 - Two types of DQM-based monitoring
 - Trigger rates and statistical quantities
 - Emulation - maybe not strictly DQM?
- Each fulfills a different type of diagnostic

(NB: I don't claim to speak for official trigger group)



Xdaq based monitoring

- Direct access to FE hardware
- Addresses question, “is data transport ok?”
- Quick access to whatever error flags the hardware itself detects
 - Error flags in status registers, e.g.
 - First line of defense against errors, with tightest connection to DAQ and hence fastest feedback to shift crew/experts
- Hardware gurus are already working on this
 - Needed to debug their hardware



DQM based monitoring

- Answers question, “what kinds of decisions is the trigger making?”
 - For Example:
 - trigger rates per trigger bits
 - Occupancies as fcn of various detector quantities vs trigger bits
 - Dead time (?)
 - Not sure where this accounting is done in CMS
 - Whatever quantities the relevant experts (GCT, RCT, DT trigger, etc) want that comes out of the data



Emulation (using DQM-like FW)

- Answers the question, “is the trigger making the right decisions?”
- Akin to DQM but likely to be time-intensive
- Same collector infrastructure needed
 - Aggregate information
- Will use L1 Emulator tools
 - Framework for Trigger Table
 - Use DQM infrastructure?
- Many working on parts



What is DQM?

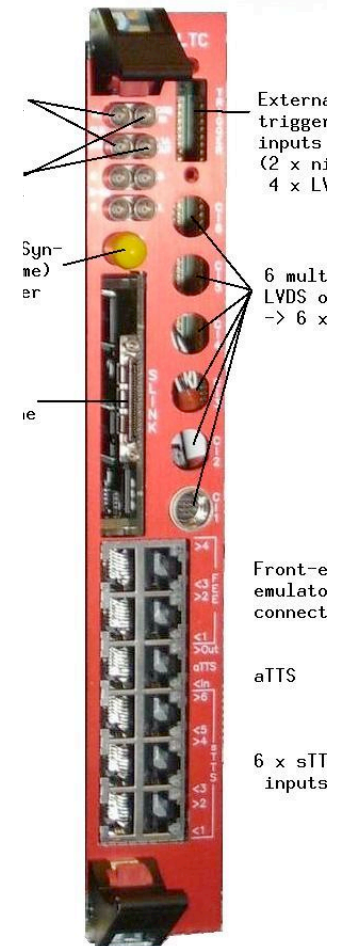
- DQM: “Data Quality & Monitoring.”
 - (See link below)
- Three part framework:
 - Sources, Collectors, Clients
- Sources: Run in HLT node, grab data
- Collectors: Collate information from Sources
- Clients: do heavy lifting; subscribe to collectors
- Clients can be web-based, e.g.

http://cmsevf.web.cern.ch/cmsevf/DQM_doc/DQM_instructions.html



Aside: Trigger at MTCC

- MTCC is using LTC as proxy for Global Trigger
- LTC: Local Trigger & Control
 - Long-term: Use as trigger substitute when partitioning detector for testing & development
 - Now: acts as proxy for GT
- Inputs: HCAL, muon systems
- Outputs: event info, basic trigger info



Q (H)	BOE (0001)		TRIG. TYPE		EVENT NUMBER										BUNCH NUMBER										SOURCE ID (B15)										FOV		H	S		T																								
	5		4 (ext), 2 or 3												3										2										P										O		O		O															
T)											ORBIT NUMBER										Revision No.					2000 words - event status, good or 10.000, COMP12															DAQ Partition																							
											O										1					O															O										O										O		O	
Q (T)	Run No.																														Trigger Number																																	
T)	No. of																														Input Status Bits																																	
Q (T)	BST GPS Time Byte 8				BST GPS Time Byte 7				BST GPS Time Byte 6				BST GPS Time Byte 5				BST GPS Time Byte 4				BST GPS Time Byte 3				BST GPS Time Byte 2				BST GPS Time Byte 1																																			
S) (T)	EOE (1010)		EVENT LENGTH										CRC (16)										OVRT (EXT 16)										TTS		T	S		T																										
A	O		O										O										O										O										O		O		O																	

LTC Slink Data Format

DQM monitoring for MTCC

- LTC bank contains limited trigger information
 - Single bit inputs from subsystems limit
- No TPC's used to make trigger decision in the bank
 - LTC only gets “yeah or neah” from subsystem
- Isn't in CMSSW yet
 - First job

Trigger ID (run, event, orbit, bunch)
Trigger lines set
Trigger Inhibits (dead time info)
Timing information (GPS or locally set clock)



Work plan in broad strokes

- Write bank accessors for LTC bank
- Provide basic histograms for MTCC from it
 - Also tools for offline analysis at same time
 - Useful longer-term too past MTCC
- Move on to GT next
 - Definitions of subsystems' data formats still in flux/undocumented
 - Tools should be portable between MTCC and full system
- Contribute to L1 Emulation
 - Most subsystems have TPG emulation in progress
 - See Sridhara's talk
 - People at Cornell interested in developing framework for knitting it together

